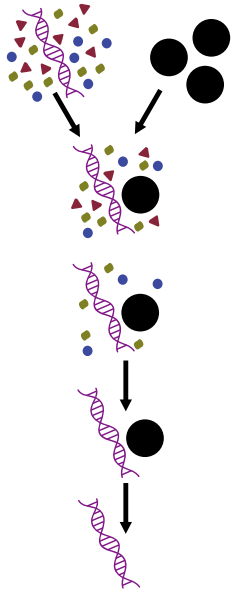
Extract high yields of pure genomic DNA from human blood

Following the sequencing of the human genome, clinical research has increasingly focused on large-scale genotyping. These applications have created an urgent need for a cost-effective, user-friendly chemistry for the extraction of genomic DNA from blood. GeneCatcher™ Technology (GCT™) provides a flexible, magnetic bead–based method (Figure 1) that meets the requirements of current demands, including:

- → Superior performance on difficult blood samples
- → High purity and yield of extracted DNA
- → Single-tube extraction to facilitate sample tracking
- → Quick benchtop protocol, with scalable extraction from a wide range of sample volumes (Figure 2)

High yields of pure DNA

The GeneCatcher™ gDNA Blood Kits facilitate the efficient and reliable extraction of genomic DNA (gDNA) from human blood, even when blood samples have been archived, poorly stored, or collected in the presence of anticoagulants such as EDTA, heparin, or citrate. The GeneCatcher™ gDNA Blood Kits, available for 0.3–1 ml and 3–10 ml sample sizes, consistently outperform traditional extraction methods, producing higher yields of pure DNA (Figure 3). Although the amount of DNA purified from blood samples with the GeneCatcher™ gDNA Blood Kits will depend on sample volume and white blood cell count, a typical genomic DNA yield from 10 ml of healthy blood is 300 µg. Moreover, the high-purity DNA extracted using GeneCatcher™ Technology is suitable for use in downstream applications, including quantitative PCR, restriction endonuclease digestion (Figure 4A), and second-generation multiplex (SGM) and single tandem repeat (STR) profiling (Figure 4B).



Step 1—DNA capture. Cells are lysed and crude DNA is captured on magnetic beads, leaving most of the cell debris and protein in solution.

Step 2—DNA purification. Residual protein is digested and then washed away to leave pure intact DNA.

Step 3—DNA elution. The pure DNA is then eluted into a small volume, ready for downstream protocols.

Figure 1—GeneCatcher™ Technology. GeneCatcher™ Technology is a novel magnetic bead–based technology that provides a method for reliably and efficiently purifying DNA without any centrifugation steps. This three-step procedure enables scalable, single-tube purification of genomic DNA from large (up to 10 ml) blood samples.

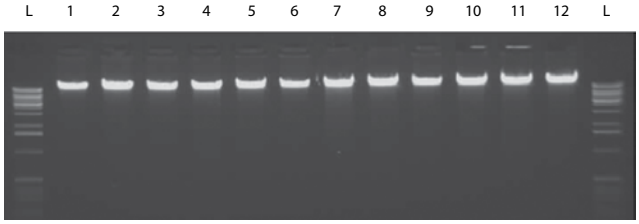


Figure 2—Scalable extraction from different volumes. Genomic DNA was extracted from various volumes of a single source of human blood. From each genomic DNA eluate, 10 µl was diluted, run on an agarose gel, and visualized with ethidium bromide. Lane L: Invitrogen 1 Kb DNA Extension Ladder, largest band 40 Kb; lanes 1 and 2: 3 ml of blood; lane 3: 4 ml of blood; lanes 4 and 5: 5 ml of blood; lane 6: 6 ml of blood; lanes 7 and 8: 7 ml of blood; lane 9: 8 ml of blood; lanes 10 and 11: 9 ml of blood; lane 12: 10 ml of blood. Extractions from 2 ml blood samples have also been successfully tested (data not shown).

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Scalable DNA isolation ready for automation

GeneCatcher™ Technology has been designed and optimized for scalable and automated genomic DNA isolation from blood samples using the Tecan® Freedom EVO® liquid handling platform (Figure 5A); it requires no centrifugation or filtration steps and uses reagents that will not clog lines or cause vapor pressure buildup. Furthermore, a magnetic rack (separator) allows processing of several samples simultaneously during the magnetic bead–separation steps. To obtain the best results with the GeneCatcher™ gDNA 0.3–1 ml Blood Kit, we recommend using the 24-well Magnetic Separator (Figure 5B). For the GeneCatcher™ gDNA 3–10 ml Blood Kit, we recommend the 50 ml tube Magnetic Separator (Figure 5C). These magnetic separators are compatible with the volumes used in the kit protocols and provide effective magnetic strength from neodymium magnets, which are aligned with plate wells or tubes, respectively.

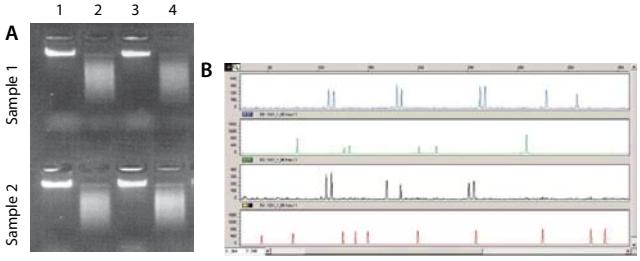

Figure 4—High-purity DNA for downstream processing. **A.** Two genomic DNA samples were processed in duplicate using the GeneCatcher™ gDNA 3–10 ml Blood Kit and then digested with *DraI*. Lanes 1 and 3: undigested genomic DNA; lanes 2 and 4: genomic DNA digested with *DraI*. **B.** In a study using seven different blood samples processed in duplicate by two different laboratories using the GeneCatcher™ gDNA 3–10 ml Blood Kit, 100% of second-generation multiplex (SGM) and single tandem repeat (STR) profiles passed quality criteria for use on the UK National DNA Database.

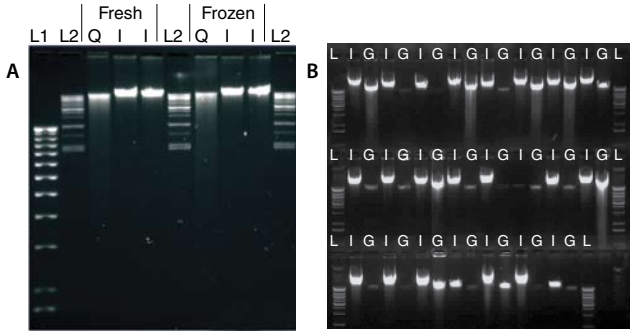

Figure 3—Consistently higher yields than benchmark extraction methods. **A.** An 0.6% agarose gel was used to evaluate genomic DNA extracted from fresh and frozen whole blood samples. Blood samples were split into three equal aliquots, and genomic DNA was extracted using the GeneCatcher™ gDNA Blood Kit and a kit from Competitor Q, which employs a silica spin column for DNA purification. Lane L1: Invitrogen 1 Kb Plus DNA Ladder; lane L2: Invitrogen High Molecular Weight DNA Markers; lane Q: Competitor Q extraction; lane I: Invitrogen GeneCatcher™ extraction. **B.** An 0.8% agarose gel was used to evaluate genomic DNA extracted from 23 archived whole blood samples that had been frozen for >8 years. Blood samples were split into two equal aliquots, and gDNA was extracted using the GeneCatcher™ gDNA Blood Kit and a kit from Competitor G, which employs a traditional lysis/precipitation DNA purification method that has been shown to copurify agents that inhibit downstream applications. Lane L: Invitrogen 1 Kb DNA Extension Ladder, largest band 40 Kb; lane I: Invitrogen GeneCatcher™ extraction; lane G: Competitor G extraction.

Figure 5—Ready for automation. **A.** The protocol for the GeneCatcher™ gDNA 3–10 ml Blood Kit can be automated on the Tecan® Freedom EVO® platform, whereas the protocol for the GeneCatcher™ gDNA 0.3–1 ml Blood Kit can be automated on the Hamilton STAR and Tecan® Freedom EVO® platforms. **B.** The GeneCatcher™ gDNA 0.3–1 ml Blood Kit works well with the 24-well Magnetic Separator and a 24 Deep Well RB Block. The 24-well Magnetic Separator contains 6 neodymium magnets that are perfectly aligned with the wells of a 24-well plate for simple sample processing using magnetic beads. **C.** The GeneCatcher™ gDNA 3–10 ml Blood Kit works well with the 50 ml tube Magnetic Separator, which has a rack that holds four 50 ml tubes in alignment with the neodymium magnets for sample processing.

Ordering information

To view full product details or to order GeneCatcher™ gDNA Blood Kits, visit www.invitrogen.com/nap.

Product	Quantity	Cat. no.
GeneCatcher™ gDNA 0.3–1 ml Blood Kit, containing sufficient reagents for 96 samples of up to 1 ml	1 kit	CS21101
GeneCatcher™ gDNA 3–10 ml Blood Kit, containing sufficient reagents for 66 x 3 ml or 20 x 10 ml samples	1 kit	CS21110
24-well Magnetic Separator	1	CS15024
50 ml tube Magnetic Separator	1	CS15050
24 Deep Well RB Block	case of 25	CS15124
Lids for 24 Deep Well RB Block	case of 25	CS15125